



WHAT IS THE CONNECTION BETWEEN ORAL HEALTH & CARDIOVASCULAR DISEASES?

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ABSTRACT

The relationship between oral health and cardiovascular diseases (CVD) has gained significant attention in recent years. Emerging research suggests a potential connection between oral health, specifically gum disease, and the development of cardiovascular ailments such as heart attacks and strokes. Bacteria originating from oral infections can enter the bloodstream, leading to inflammation in the heart's blood vessels and infection in the heart valves. This literature review explores the link between oral health and cardiovascular diseases, highlighting the mechanisms underlying this association. Two previous studies are reviewed, emphasizing the impact of dental hygiene practices on heart health. It was found that the connection between oral health and cardiovascular diseases is evident and it is crucial for promoting overall well-being and underscores the importance of maintaining good oral hygiene.

KEYWORDS: oral health, cardiovascular diseases, gum disease, bacteria, inflammation, heart health.

INTRODUCTION

The relationship between oral health and cardiovascular diseases (CVD) has garnered increasing attention, raising intriguing possibilities regarding the role of dental hygiene in preventing heart problems. While factors such as diet, exercise, and smoking are well-established contributors to CVD, recent research has unveiled a potential connection between oral health and cardiovascular health. This revelation underscores the significance of maintaining good dental hygiene in preventing heart-related ailments. According to the World Health Organization, oral health encompasses the condition of the mouth, teeth, and orofacial structures, enabling individuals to perform essential functions like eating, breathing, and speaking. Furthermore, it encompasses psychosocial aspects, such as self-confidence, well-being, and the ability to engage in social and professional interactions without experiencing pain, discomfort, or embarrassment.

The question arises: How does our oral health influence our overall well-being? Researchers suggest that bacteria originating from gum disease can potentially spread throughout the body, leading to inflammation in the blood vessels of the heart and infection in the heart valves. Individuals with periodontitis or other oral health issues may face an elevated risk of developing cardiovascular diseases, such as heart attacks or strokes, compared to those with good oral health. This is because when individuals have gum disease, the bacteria present in their mouth can enter their bloodstream, travel to the heart, and directly infect the delicate heart valves. This research article presents a comprehensive literature review of two previous studies, followed by an exploration of the link between oral health and cardiovascular diseases, elucidating the mechanisms underlying this intriguing connection.

Literature Review

It has long been understood that good oral health is essential to overall health and well-being. Poor dental health has been linked in studies to a wide range of systemic health issues, including cardiovascular disease. A substantial body of research has been published recently that examines the link between cardiovascular disease and dental health. Studies in the past have linked periodontal disease, characterized by gum infection, gum inflammation, and tooth destruction, to heart disease. In 2018, Dr. Shogo Matsui led a new study that examined whether a person's toothbrushing practices were related to their chance of experiencing or passing away from a heart attack, heart failure, or stroke. Throughout their experiment, 682 individuals were questioned by researchers regarding their brushing habits. After correcting for a number of variables, they discovered that the risk was three times higher for those who reported brushing fewer than twice daily for less than two minutes than for those who reported brushing at least twice daily for at least two minutes. Dr. Shogo Matsui (2018) stated that the results show "poor oral health, based on daily teeth-brushing behavior, is associated with" lower heart health. The study was not intended to establish cause-and-effect, according to Matsui, a researcher at the Institute of Biomedical and Health Sciences at Hiroshima University in Japan. However, lengthier brushing sessions may lessen this risk. Supporting Matsui's statement, Dr. Ann Bolger, a cardiologist and retired professor of medicine at the University of California, San Francisco, agreed that the observational study had drawbacks.

Another previous research was a comparative study using the Korea National Health and Nutrition Examination Survey data. The purpose of this study was to

investigate the link between oral health status and hygiene practices among adults and the elderly who had a history of chronic illness or coronary artery disease. Data were gathered from the 2016–2017 Korea National Health and Nutrition Examination study. Adults over the age of 30 with hypertension, diabetes, dyslipidemia, a history of myocardial infarction, or angina were considered to be in the cardiovascular risk group. Propensity score matching (PSM) was used to separate and analyze the adult and old groups, and SPSS and R were used to run a sophisticated sample logistic regression analysis. In adults, dentists identified periodontal disease in 25.1% of the healthy group and in 41.9% of the risk group. 40.0% of senior individuals in the risk group reported chewing issues, and 17.5% experienced speaking issues. It was revealed that the risk group's prevalence of periodontal disease was substantially greater than that of the healthy group. As a result, it can be concluded that adults at cardiovascular risk under the age of 65 require routine evaluations and instruction on the value of maintaining dental health for either primary or secondary prevention. They should also receive instruction from healthcare providers to assist them maintain sufficient oral hygiene and wellness.

Discussion

1. Oral Bacteria & Atherosclerosis

Based on numerous studies, some bacterial species found in human mouths may raise the risk of cardiovascular disease development. Although there are healthy bacteria that function to protect our mouth in the ecosystem of the oral microbe such as limiting tooth decay, there are also disadvantageous bacteria that are known to lead to cavities and illness. It is worth wondering how the bacteria in our mouth can be fatal if they are an essential component in maintaining good oral health. In fact, these bacteria may enter the circulation of the body through the gums and migrate to other regions of the body, including the heart. During the process, if the bacteria penetrate the circulation and create an inflammatory reaction, the endothelial cells that line the blood arteries may get damaged. As a result, atherosclerotic plaques may develop which will then eventually obstruct blood flow and result in cardiovascular disease (Leishman et al., 2010). Additionally, certain oral bacterial species create substances that might directly harm heart tissue, resulting in heart disease. For instance, *Porphyromonas gingivalis*, the cavity's subgingival sulcus of an individual, has been discovered in the plaques of people with heart disease (How et al., 2016). This has been connected to the onset of atherosclerosis, a typical condition that occurs when the arteries get clogged with a sticky material called plaque. Interestingly, the most common reason for mortality in the US is a condition related to atherosclerosis (Lusis, 2000; Pahwa & Jialal, 2022). Studies have suggested that *P. gingivalis* can act and penetrate ECs (the name of a chemotherapy combination made up of epirubicin and cyclophosphamide), cause endothelial dysfunction, impair endothelial integrity, and subsequently encourage the creation and development of atherosclerotic plaques (Gao et al., 2021). Adding on, according to the Mayo Clinic (2022), an individual may develop coronary artery disease, which can result in chest discomfort (angina), a heart attack, or heart failure, if atherosclerosis narrows the arteries near the heart. While more investigation is required to understand the connection between oral bacteria and cardiovascular disease fully, it is evident that oral bacteria may lead to cardiovascular diseases if not taken care of properly.

2. Mechanism of Plaque-Induced Inflammation

Cardiovascular illnesses arise and advance due to inflammation in the heart's

blood arteries. As stated by the University of Pennsylvania Health System (2022) also known as Penn Medicine, gum disease and the inflammation that can come before heart attacks, strokes, and unexpected vascular events are related although the precise nature of the cause-and-effect relationship is currently unknown. As previously stated, gum disease-related bacteria can spread throughout the body, causing heart vessel inflammation and heart valve infection. However, it is inflammation, the body's immune response to the problem, rather than bacteria, that starts a cascade of vascular damage throughout the body, including the heart and brain. One of the main risk factors for cardiovascular disease is inflammation in the blood vessels that supply the heart. As a result of inflammation of the arterial walls, atherosclerosis, a condition marked by plaque formation and artery narrowing, can start to develop. As mentioned briefly previously, atherosclerosis steadily takes hold when plaque is formed in the blood by cholesterol, fat, blood cells, and other elements. The arteries narrow as a result of plaque buildup. As a result, the body's essential organs receive less blood that is oxygen-rich. With the heart not receiving enough oxygen and nutrients to operate correctly due to restricted or blocked arteries that deliver blood to the heart, limitation of blood flow to the heart will be created which will then result in chest pain or discomfort (angina), breathlessness, or even a heart attack. Inflammation may also weaken and make the artery walls more vulnerable to rupture, which may result in the production of blood clots that further obstruct blood flow. Consequently, with various effects of inflammation in the heart's blood arteries, the risks of occurrence of cardiovascular diseases increase.

While some people may argue that there is no actual connection between the two conditions since cardiovascular disease and dental health are two separate illnesses with a wide range of potential causes and risk factors, the growing evidence reveals otherwise. It is now known worldwide that every component of our body is somehow related to one another. This applies also to the mouth and the heart. With these two components being connected, bacteria present in the mouth can travel throughout the body toward the heart while triggering inflammation in the heart's vessels and infection in heart valves. With the outcomes of this action, consequences such as swelling of the arteries occur which naturally increases the risk of cardiovascular diseases.

Conclusion

Substantial evidence indicates that there is indeed a significant connection between oral health and cardiovascular disease, despite the understanding that the relationship is complex and multifactorial. When people have gum disease, the bacteria in their mouth can enter their circulation, travel to their heart, and directly infect the delicate heart valves, making them more prone to cardiovascular diseases like heart attacks or strokes than people with good oral health. In more detail, through the gums, oral bacteria may enter the bloodstream and spread to other parts of the body, including the heart, leading to the possibility of cardiovascular diseases. With the knowledge about how different oral bacteria may enter the body's circulation system and how they may progress into cardiovascular diseases, it is more evident that preserving good dental health is important for general cardiovascular health in addition to having healthy teeth and gums.

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